

IN THE CLAIMS

1. In a communications system having a plurality of microphones at a transmitting location transmitting over separate corresponding plurality of channels to corresponding speakers in a receiving location and a plurality of microphones at the 5 receiving location coupled over corresponding plurality of channels to speakers at the transmitting location generating echo signals, a multi-channel acoustic cancellation system comprising:

sub B2
filter means coupled to output of said plurality of microphones at said transmitting location and input to said plurality of speakers at receiving location for providing 10 estimated signals representing estimates of echo path responses from said plurality microphones from said receiving location to said plurality of speakers at said transmitting location;

means coupled to input of said plurality of speakers at said transmitting location and output of said microphones at said receiving location for providing true signals 15 representing true echo signal;

means for subtracting said true signals from said estimated signals to reduce echo signals and to obtain coefficient control signals representing errors;

means for coupling said coefficient control signals to said filter means to change the filter coefficients to minimize said errors; and

20 means for providing decorrelation of said signals using all-pass filters in said channels having different time varying filtering.

2. The system of Claim 1 wherein the time varying parameter takes a bounded random walk.

sub B3 3. The system of Claim 2 where the bounds in the value are based on data for just noticeable time delay difference from psychoacoustics.

5 4. The system of Claim 3 where the noticeable delay is between 30 and 200 microseconds.

5. The system of Claim 1 where the filter means include finite impulse response (FIR) filters that have filter coefficients updated adaptively depending on the input signals to the loudspeakers and outputs of the microphones.

10 6. A multi-channel acoustic cancellation system comprising:

sub B4 filter means coupled to output of said plurality of microphones at a transmitting location and input to a plurality of speakers at receiving location for providing estimated signals representing estimates of echo path responses from said plurality microphones from said receiving location to said plurality of speakers at said transmitting location;

15 means coupled to input of a plurality of speakers at said transmitting location and output of a plurality of microphones at said receiving location for providing true signals representing true echo signal;

means for subtracting said true signals from said estimated signals to reduce echo signals and to obtain coefficient control signals representing errors;

means for coupling said coefficient control signals to said filter means to change

the filter coefficients to minimize said errors; and

sub B4 means for providing decorrelation of said signals in said separate corresponding

plurality of channels by providing an all-pass filter having different time varying filtering

5 in each channel.

7. The system of Claim 6 wherein the time varying parameter takes a
bounded random walk.

sub B5 8. The system of Claim 7 where the bounds in the value are based on data for
just noticeable time delay difference from psychoacoustics.

10 9. The system of Claim 8 where the noticeable delay is between 30 and 200
microseconds.

10. A multi-channel acoustic cancellation system comprising:

sub B6 means coupled in said signal path between said transmitting location and
said receiving location for reducing echo errors and means in said signal path for
15 providing decorrelation of said signals in said separate corresponding plurality of
channels by providing an all-pass filter having different time varying filtering in each
channel.

11. The system of Claim 10 wherein the time varying parameter takes a
bounded random walk.

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12. The system of Claim 11 where the bounds in the value are based on data
for just noticeable time delay difference from psychoacoustics.
13. The system of Claim 12 where the noticeable delay is between 30 and 200
microseconds.